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EX PARTE OR LATE FILED

January 27, 1997

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, NW
Washington, D.C. 20554

Re: MM Docket No. 87-268
Advanced Television Systems and
Their Impact Upon the Existing
Television Broadcast Stations

Dear Mr. Caton:

On January 24, 1997, Hubbard Broadcasting, Inc. filed its Reply Comments to Comments on the Sixth Notice of Proposed Rulemaking in the above-referenced proceeding. The Technical Statement submitted with the Reply Comments did not bear the original signature of the consulting engineer. Submitted herewith is the original of the Technical Statement bearing the signature of Charles A. Cooper of du Treil, Lundin & Rackley, Inc.

Should there be any questions, please contact the undersigned.

Very truly yours,

Marvin Rosenberg
Counsel for
Hubbard Broadcasting, Inc.

mr:ik
Enclosures

du Treil, Lundin & Rackley, Inc.
A Subsidiary of A.D. Ring, P.A.

TECHNICAL EXHIBIT
REPLY COMMENTS OF HUBBARD BROADCASTING

JANUARY 24, 1997

TECHNICAL EXHIBIT
REPLY COMMENTS OF HUBBARD BROADCASTING

Technical Statement

This Technical Exhibit was prepared on behalf of Hubbard Broadcasting as part of Hubbard's reply comments in the Federal Communication Commission's (FCC) Sixth Further Notice of Proposed Rule Making (FNPRM) in MM Docket No. 87-268. This proceeding concerns advanced television systems and their impact upon the existing television broadcast service. Hubbard is the licensee of ten full-service television stations, including two which operate on channels 4 and 5. Additionally, programming from Hubbard's stations is duplicated on 108 low power television translator stations.

If full accommodation and replication of existing NTSC service areas is the real goal of DTV, then all VHF stations should return to their present NTSC channels for the final DTV operations as was stated by several commentators in this proceeding. It is suggested that each station be assigned a second channel for DTV use during the transition period, as to what has been proposed by the FCC in this proceeding. Returning to the present NTSC channel, the VHF channels in particular, is the best means of insuring present coverage. It will preserve free over-the-air television service for more of the persons presently receiving service, involve less power, be more spectrum efficient, cause less interference, have less impact on LPTV service, and still permit the possible recapture of spectrum for other uses.

Full-Service Allotment Considerations

As can be seen from Figure 1, of the ten Hubbard full-service stations, eight of the stations presently operate in VHF spectrum. These eight stations serve widespread coverage areas with favorable signal propagation and relatively low effective radiated powers, typical with VHF broadcast stations. Under the FCC's DTV reallotment plan, all but one of Hubbard's VHF stations will migrate into the UHF spectrum. None of Hubbard's full-service stations are allocated, including the existing NTSC and the proposed DTV channels, within Channels 60 to 69 being considered for recapture for other services. However, two very significant stations presently operate on channels 4 and 5 which the Commission and some parties have suggested should not be retained for television use.

In the FCC's attempt to replicate NTSC VHF broadcast coverage areas with a DTV UHF broadcast facility, a large increase in effective radiated power is required. Of the seven Hubbard VHF stations the FCC proposes to migrate into UHF spectrum, the average increase in effective radiated power (NTSC peak power to DTV average power) is 11 decibels or 13 times the existing power. This increase in power is not practical to implement in Hubbard's opinion due to the required large numbers of power amplifiers, great input electrical power and transmission line size.

It is well recognized that television signals propagating on VHF channels, particularly in the low band (channel 2 to 6), refract better around terrain obstructions and the curvature of the earth than do those propagating on UHF channels. There is also less signal attenuation of the VHF signal than UHF signal. This fact is recognized by the FCC in the computation of the television station's Grade A

and Grade B coverage contours. The Grade A coverage contours for two collocated VHF and UHF broadcast stations (transmitting with the same antenna height and equivalent power) are somewhat identical, however, the VHF station's Grade B coverage contour extends much further than the UHF station's coverage contour.

This coverage disparity between VHF and UHF stations arises when the VHF signal can propagate past the radio horizon, that is where the transmission beam grazes the earth and "spills" over the edge. Due to the higher frequencies, UHF transmissions are basically terminated at the radio horizon with very little signal spilling over the edge or beyond the radio horizon. Therefore, to propagate UHF signals beyond the radio horizon, enormous effective radiated powers are required.

In order to avoid possible confusion, the effective radiated power for DTV is stated as the average (RMS) whereas the NTSC effective radiated power is defined as the peak-of-sync. To convert a DTV effective radiated power to a NTSC equivalent power, the DTV power has to be multiplied by 4 (or increased by 6 decibels). Therefore, equipment manufactured for DTV operation, such as transmitters, antennas and transmission lines, have to be designed to withstand the average DTV power times 4. For example, the KSTP-TV DTV facility proposed by the FCC specifies an average effective radiated power of 3,134 kilowatts. This is a NTSC equivalent peak effective radiated power of 12,536 kilowatts (3,134 x 4) which the DTV transmitting facility must render.

Since a UHF facility cannot realistically replicate VHF coverage areas, present service areas will be lost and millions of the viewers presently receiving free

off-the-air television will be denied that service. Figure 2 is a map showing NTSC coverage areas of Hubbard station KOB-TV on VHF Channel 4 at Albuquerque, New Mexico. The present KOB-TV NTSC peak effective radiated power is 26.8 kilowatts. The FCC predicted Grade B coverage contour is shown as well as the Longley-Rice predicted coverage areas.[1] The dots shown on the map indicate areas of received interference from other stations and allotments. Red dots are areas of predicted NTSC interference; yellow dots are areas of predicted DTV interference from stations identified in the FCC allotment table. Figure 3 is a similar map for the KOB-TV FCC proposed DTV facility on UHF Channel 48. As suggested by the FCC, the KOB-TV average DTV effective radiated power is 718 kilowatts.

The favorable VHF signal propagation is easily distinguishable between the KOB-TV NTSC and DTV facilities, despite the effective radiated power increasing from 26.8 kilowatts peak to 718 kilowatts average (15 decibel or 27 times increase). With the present NTSC facility, service to persons is actually provided beyond the FCC predicted Grade B coverage contour, whereas for the proposed DTV facility, replication of present service is not even predicted within the Grade B coverage contour. It is noted for the KOB-TV UHF facility that an environmental clutter factor of 6 decibels was employed to account for attenuation differences between VHF and UHF facilities caused by urbanized areas and vegetation.

The population residing within the NTSC KOB-TV Longley-Rice predicted coverage areas free of predicted

[1] The Longley-Rice is a point-to-point signal propagation model that considers the actual terrain present between a transmitter and a receiver. The Longley-Rice model was also employed by the FCC in the assignment process.

interference is 788,500 persons.[2] The population residing within the KOB-TV DTV Longley-rice predicted coverage areas free of predicted interference is 752,000 persons. Therefore, 36,500 persons presently serviced by NTSC KOB-TV are predicted not to receive DTV KOB-TV service.

The KOB-TV service loss areas can be identified by comparing the NTSC and DTV coverage maps. As can be seen, these loss areas are mostly located near the NTSC Grade B contour where existing NTSC signal levels are at a low level and an outdoor receiving antenna is required. These areas can be characterized with widespread scattered population and low cable penetration.

The existing NTSC and proposed DTV coverage areas of Hubbard station KSTP-TV at St. Paul, Minnesota were also calculated. KSTP-TV presently operates on VHF Channel 5 with a peak effective radiated power of 100 kilowatts. Under the FCC's reallotment table, it is proposed that KSTP-TV migrate to Channel 50 with an average effective radiated power of 3,134 kilowatts. As the 3,134 kilowatts average DTV effective radiated power will not be practical to implement, a more realistic value of 1,000 kilowatts average was employed for the coverage calculations.

For KSTP-TV to achieve a FCC proposed average effective radiated power of 3,134 kilowatts, a minimum transmitter peak power rating of 600 kilowatts is required. From information provided by two broadcast transmitter manufacturers, Comark and Acrodyne, a transmitter cost estimate has been made. The cost for a 600 kilowatt peak power output transmitter would be around $4,000,000. Furthermore, 600 kilowatt transmitters are not currently

[2] The population figures were obtained from the 1990 U.S. Census of Population and Housing.

manufactured. In addition to the large transmitter costs, there will be significant costs for the waveguide and antenna system to handle these power levels. Also, due to the increased windloading from additional DTV transmitting antennas, tower modification costs will also be substantial.

Figures 4 and 5 are coverage maps showing the KSTP-TV Grade B coverage contour and the Longley-Rice predicted coverage areas for both the NTSC and DTV KSTP-TV facilities, respectively. The areas of received interference are also shown. Within the existing NTSC Longley-Rice service areas, 3,027,600 persons are predicted to receive interference-free service. For the proposed DTV facility, 3,009,200 persons are predicted to receive interference-free service within the Longly-Rice service areas. This represents a loss of service to 18,400 persons even though the effective radiated power is increasing from 100 kilowatts peak to 1,000 kilowatts average (10 decibel or 10 times increase).

As noted, the Longley-Rice signal propagation model, similar to the models used by the FCC and others, was employed to predict NTSC and DTV service areas. Based on the actual experience of Hubbard personal, existing NTSC service of both KOB-TV and KSTP-TV is known to extend beyond what is predicted by both the Longley-Rice model and the FCC Grade B contour. It is also known that at these areas of non-predicted service, UHF signals from stations located at or nearby the KOB-TV and KSTP-TV transmitter sites cannot be received, while VHF stations such as KOB-TV and KSTP-TV can be received.

In DTV, the recevied picture is actually dependent upon the bit error rate (BER) of the received data stream. The previous DTV tests have initially determined the minimum

received field strength required to maintain an acceptable bit error rate. However, the effect upon bit error rates and the received picture when the DTV signal is diffracted over a terrain obstacle(s) and where signal multipath (ghosting) is present requires further study to determine if the correlation between received field strength and picture reception remain valid. Since signal multipath and obstacle attenuation is typically more pronounced at UHF channels than at VHF channels, it is expected that an even greater number of viewers will lose service if DTV operation is not permitted on the low band VHF channels (channels 2 to 6).

Low Power Television Allotment Considerations

The over-the-air programming from Hubbard's full-service stations are duplicated on 108 low power television translators located throughout the nation. A tabulation of the translators is shown on Figure 6. Most of the television translators broadcast in small communities, located outside or near a Hubbard station's Grade B contour. These isolated communities typically have difficulty receiving a full-service Hubbard station and therefore require a translator for over-the-air program reception. The translators are either usually owned by Hubbard or a local non-profit community organization.

Of the translators which duplicate Hubbard programming, forty-four stations are located between UHF channels 52 and 69, twenty-six stations are located between UHF channels 60 and 69 and twelve stations are located between VHF channels 2 and 6, inclusive, as identified on Figure 6. The FCC proposes to reallocate television service to a "core spectrum" of DTV broadcast operations between VHF channels 7 to 13 and UHF channels 14 to 51 and furthermore,

wishes to recover UHF channels 60 to 69 prior to the end of the transition period. Therefore, fifty-six (or 52 percent) of the low power television translators duplicating Hubbard programming located outside the core spectrum (between channels 2 to 6 and 52 to 69) will be displaced under the FCC's plan. These displaced stations will have difficulty being allocated to other channels as both NTSC and DTV full-service and existing low power television facilities have to be protected from interference.

In order to minimize loss of service from the low powered television translators, UHF channels 60 to 69 should be retained during the transition period. At the conclusion of the transition period, when NTSC transmission service is terminated, additional channels will become available for low power television operation. This is because low power television stations will not be precluded from the present NTSC protected "UHF Taboo" channels and only have to protect the DTV co-channel and first-adjacent channels. Therefore, preserving UHF channels 60 to 69 until after the transition period will minimize loss of existing low power television service.

Figures 7, 8 and 9 are maps showing the combined protected contour coverage of the translators and the FCC predicted Grade B contours of the full-service Hubbard stations. The population residing within the combined translator protected contour service area is approximately 664,700 persons. Since these translators may be displaced, either by being located outside the core spectrum or causing predicted interference to a full-service DTV station, these 664,700 persons presently receiving Hubbard programming from a low power translator may lose service.

The FCC also wishes to reclaim UHF channels 60 to 69 prior to the conclusion of the transition period. As noted, Hubbard presently utilizes twenty-six low power television translators on channels 60 to 69. These translators service approximately 136,100 persons within the combined protected coverage contours. It may be difficult to find replacement channels if these low power television stations are displaced due to the required protection of other full-service NTSC and DTV facilities and other existing low powered television stations. Consequently, 136,100 persons presently receiving service on channels 60 to 69 may lose service prior to the end of the transition period.

Summary

As noted, it is not possible to replicate existing VHF coverage with a UHF facility. Within just two of Hubbard's stations, KOB-TV and KSTP-TV, 54,900 persons are predicted not to receive DTV service which presently receive NTSC service. Since VHF signals propagate better around obstructions, over the radio horizon and have less attenuation than comparable UHF signals, it is virtually impossible to realistically replicate an existing VHF station's coverage with a UHF facility. Therefore, Hubbard recommends that the existing NTSC channel be retained for final DTV operation after the transition period.

If the 108 low power translators which duplicate Hubbard programming are displaced, 664,700 persons could also lose existing service. These low power television service areas are typically isolated communities which have difficulty receiving the primary Hubbard station over-the-air. Also, if the FCC reclaims channels 60 to 69 prior to

the end of the transition period, 136,100 persons could lose service. Therefore, Hubbard recommends that all channels, including UHF channels 60 to 69, be retained until after the transition period.

Charles A. Cooper

January 24, 1997

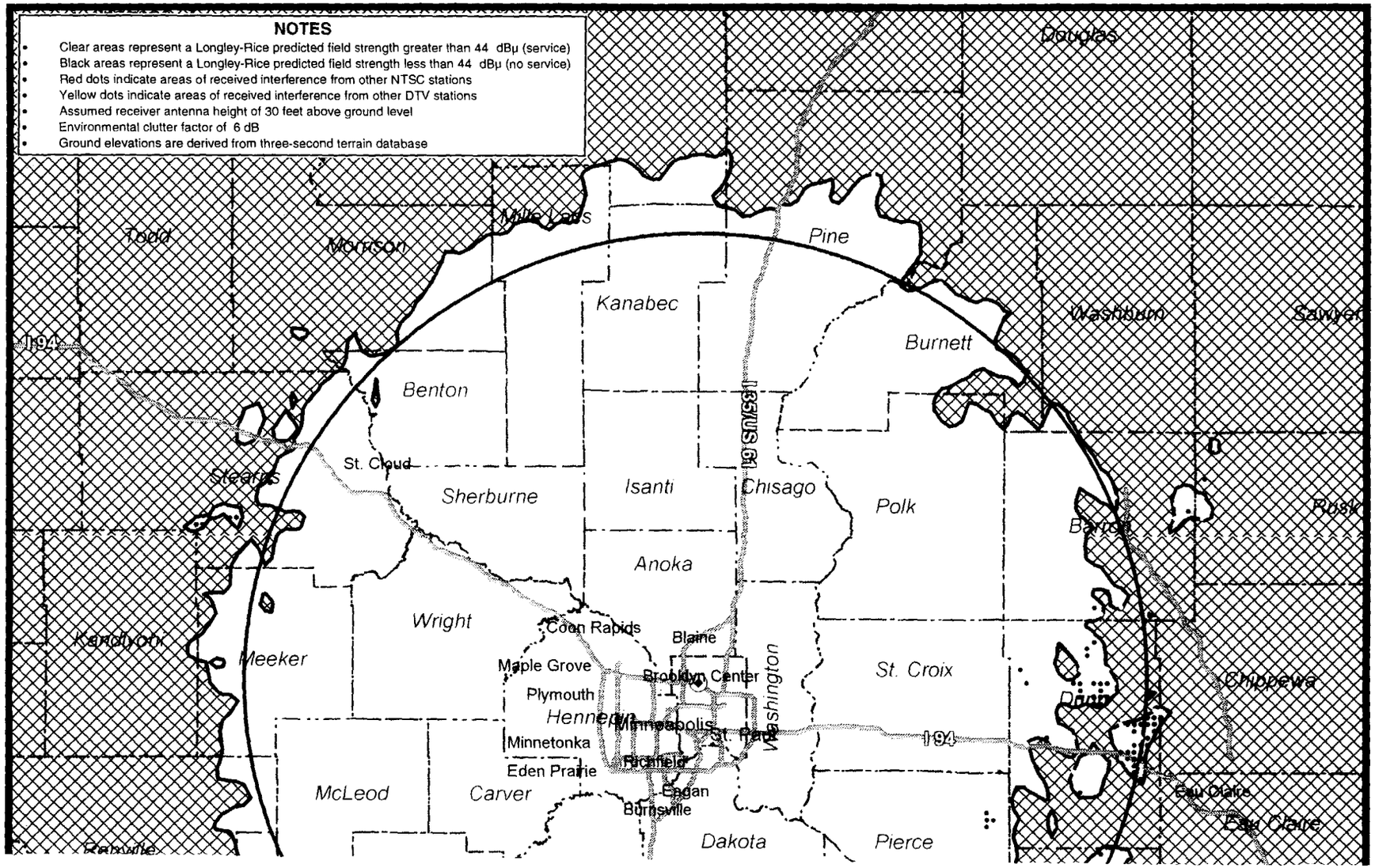
du Treil, Lundin & Rackley, Inc.
240 North Washington Blvd., Suite 700
Sarasota, Florida 34236
941.366.2611

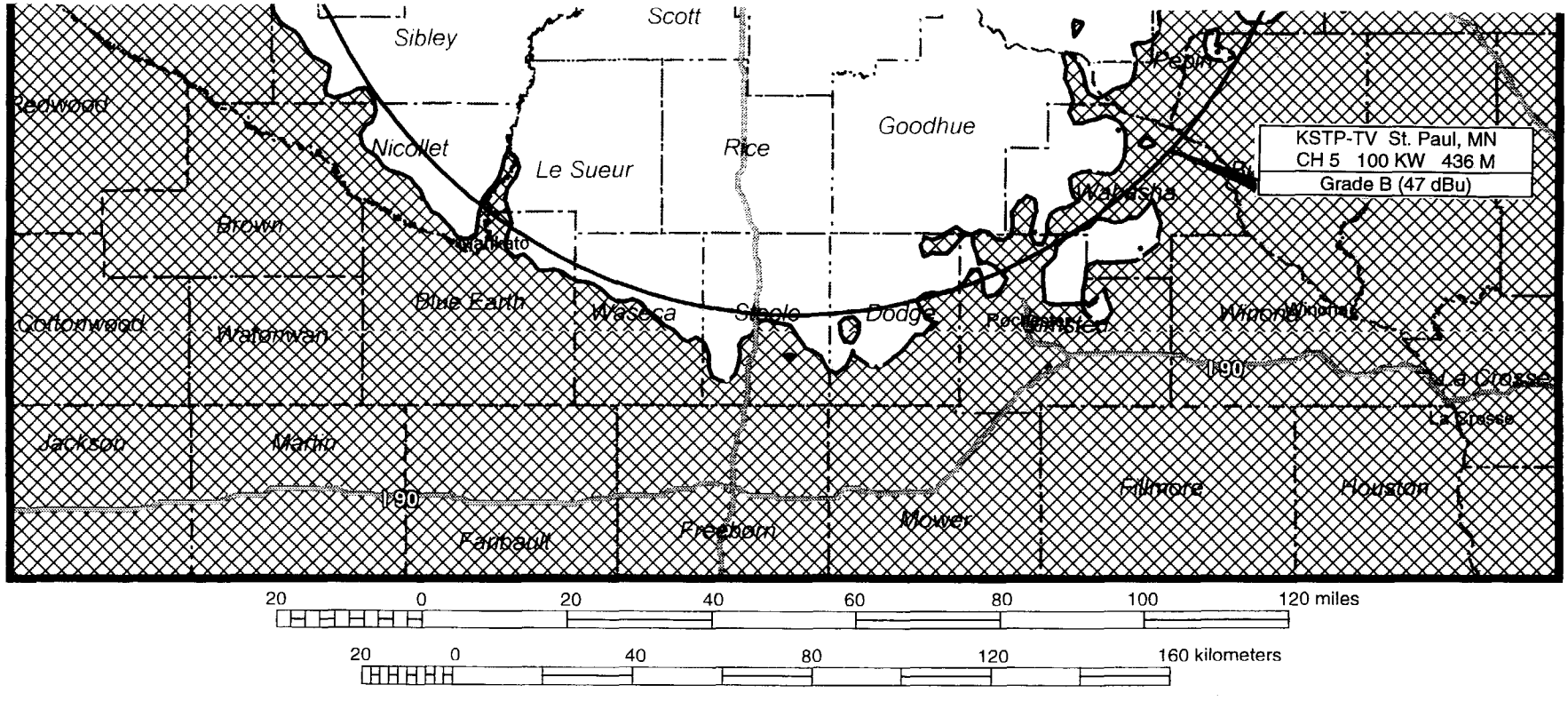
Figure 1

TECHNICAL EXHIBIT
REPLY COMMENTS OF HUBBARD BROADCASTING

Tabulation of Hubbard Broadcasting Full Service Stations

	Existing NTSC Facilities		FCC Proposed DTV Facilities		
Station	Channel	Effective Radiated Power (Peak)	Channel	Effective Radiated Power (Average)	DTV and NTSC Power Difference
KSTP-TV St. Paul, MN	5	100 kW 20 dBk	50	3135 kW 35 dBk	+15 dB (32x)
KSAX(TV) Alexandria, MN	42	2750 kW 34 dBk	28	164 kW 22 dBk	-12 dB (0.06x)
KRWF(TV) Redwood Falls, MN	43	1230 kW 31 dBk	14	50 kW 17 dBk	-14 dB (0.04x)
WDIO-TV Duluth, MN	10	316 kW 25 dBk	39	3384 kW 35 dBk	+10 dB (10x)
WIRT(TV) Hibbing, MN	13	126 kW 21 dBk	36	1016 kW 30 dBk	+9 dB (8x)
KOB-TV Albuquerque, NM	4	26.9 kW 14 dBk	48	718 kW 29 dBk	+15 dB (32x)
KOBF(TV) Farmington, NM	12	316 kW 25 dBk	15	3438 kW 35 dBk	+10 dB (10x)
KOBR(TV) Roswell, NM	8	316 kW 25 dBk	15	1700 kW 32 dBk	+7 dB (5x)
WNYT(TV) Albany, NY	13	178 kW 23 dBk	4	2 kW 3 dBk	-20 dB (0.01x)
WHEC-TV Rochester, NY	10	316 kW 25 dBk	32	3438 kW 35 dBk	+10 dB (10x)


NOTES
Clear areas represent a Longley-Rice predicted field strength greater than 44 dBμ (service)
Black areas represent a Longley-Rice predicted field strength less than 44 dBμ (no service)
Red dots indicate areas of received interference from other NTSC stations
Yellow dots indicate areas of received interference from other DTV stations
Assumed receiver antenna height of 30 feet above ground level
Environmental clutter factor of 6 dB
Ground elevations are derived from three-second terrain database
Douglas
Todd
Morrison
Mille Lacs
Pine
Kanabec
Washburn
Sawyer
Burnett
94
Benton
35W
St. Cloud
Stearns
Sherburne
Isanti
Chisago
Polk
Barron
Rusk
Anoka
Wright
Coon Rapids
Blaine
Kandiyohi
Meeker
Maple Grove
Brooklyn Center
Washington
St. Croix
Chippewa
Plymouth
Hennepin
Minneapolis
St. Paul
94
Minnetonka
Richfield
Eden Prairie
Eau Claire
McLeod
Carver
Egan
Burnsville
Dakota
Pierce

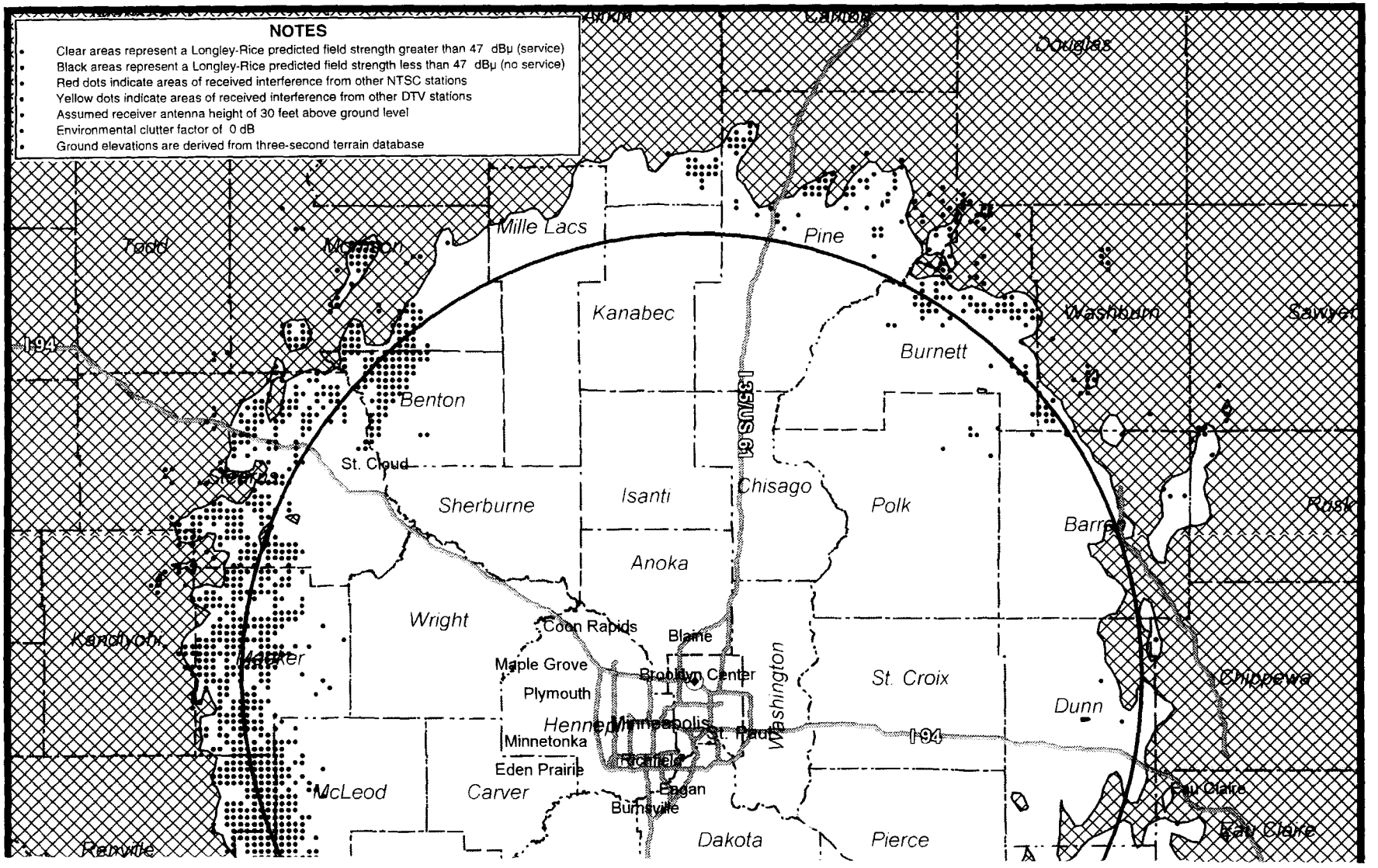


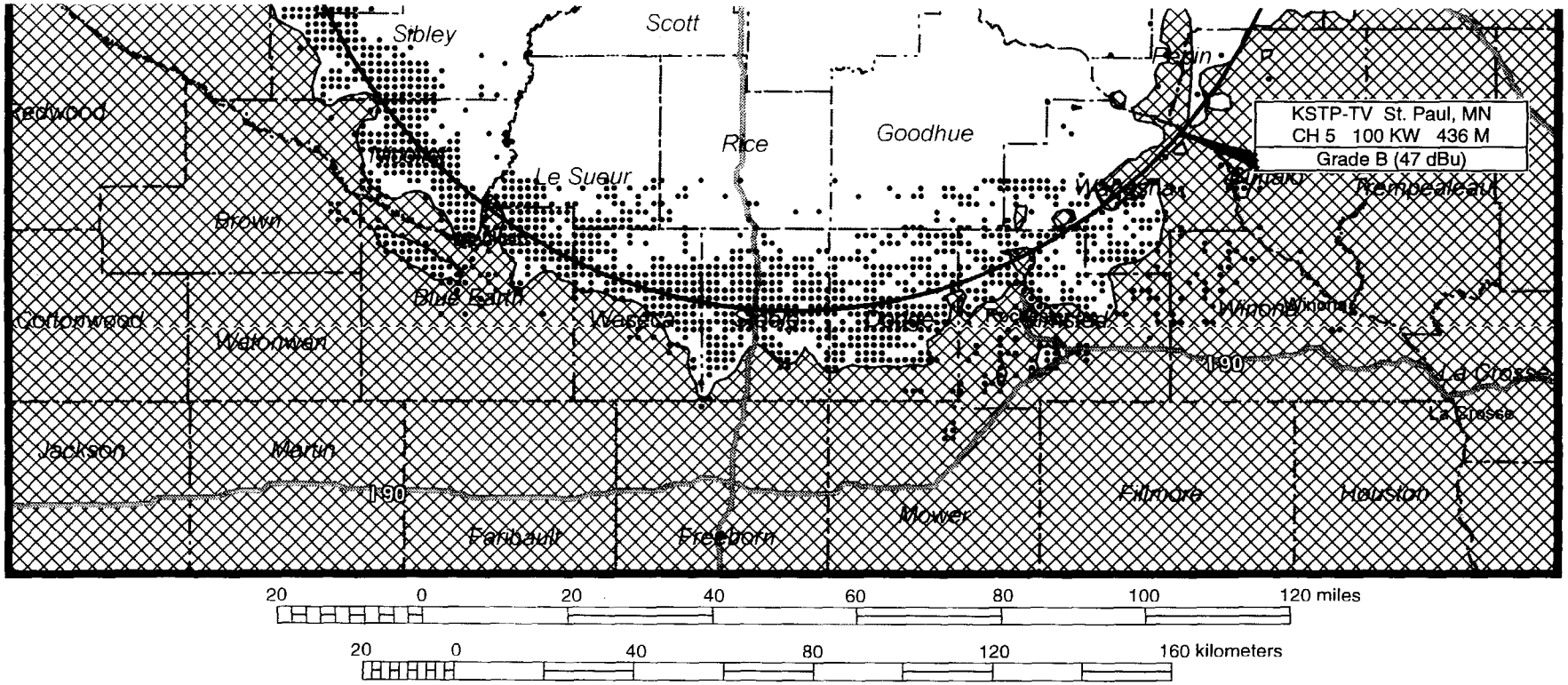
DTV SERVICE AND RECEIVED INTERFERENCE AREAS

KSTP-TV
ST. PAUL, MINNESOTA
CH 50 1000 KW 436 M

du Treil, Lundin & Rackley, Inc., Sarasota, Florida

Figure 5


NOTES
Clear areas represent a Longley-Rice predicted field strength greater than 47 dBμ (service)
Black areas represent a Longley-Rice predicted field strength less than 47 dBμ (no service)
Red dots indicate areas of received interference from other NTSC stations
Yellow dots indicate areas of received interference from other DTV stations
Assumed receiver antenna height of 30 feet above ground level
Environmental clutter factor of 0 dB
Ground elevations are derived from three-second terrain database
Aitkin
Carlton
Douglas
Todd
Morrison
Mille Lacs
Pine
Kanabec
Washburn
Sawyer
I-94
Burnett
Benton
I-35/US 61
St. Cloud
Sherburne
Isanti
Chisago
Polk
Barron
Rusk
Anoka
Wright
Coon Rapids
Blaine
Kandiyohi
Meeker
Maple Grove
Brooklyn Center
Plymouth
St. Croix
Chippewa
Dunn
Hennepin
Minneapolis
St. Paul
Washington
I-94
Minnetonka
Richfield
Eden Prairie
McLeod
Carver
Eagan
Burnsville
Eau Claire
Dakota
Pierce
Renville

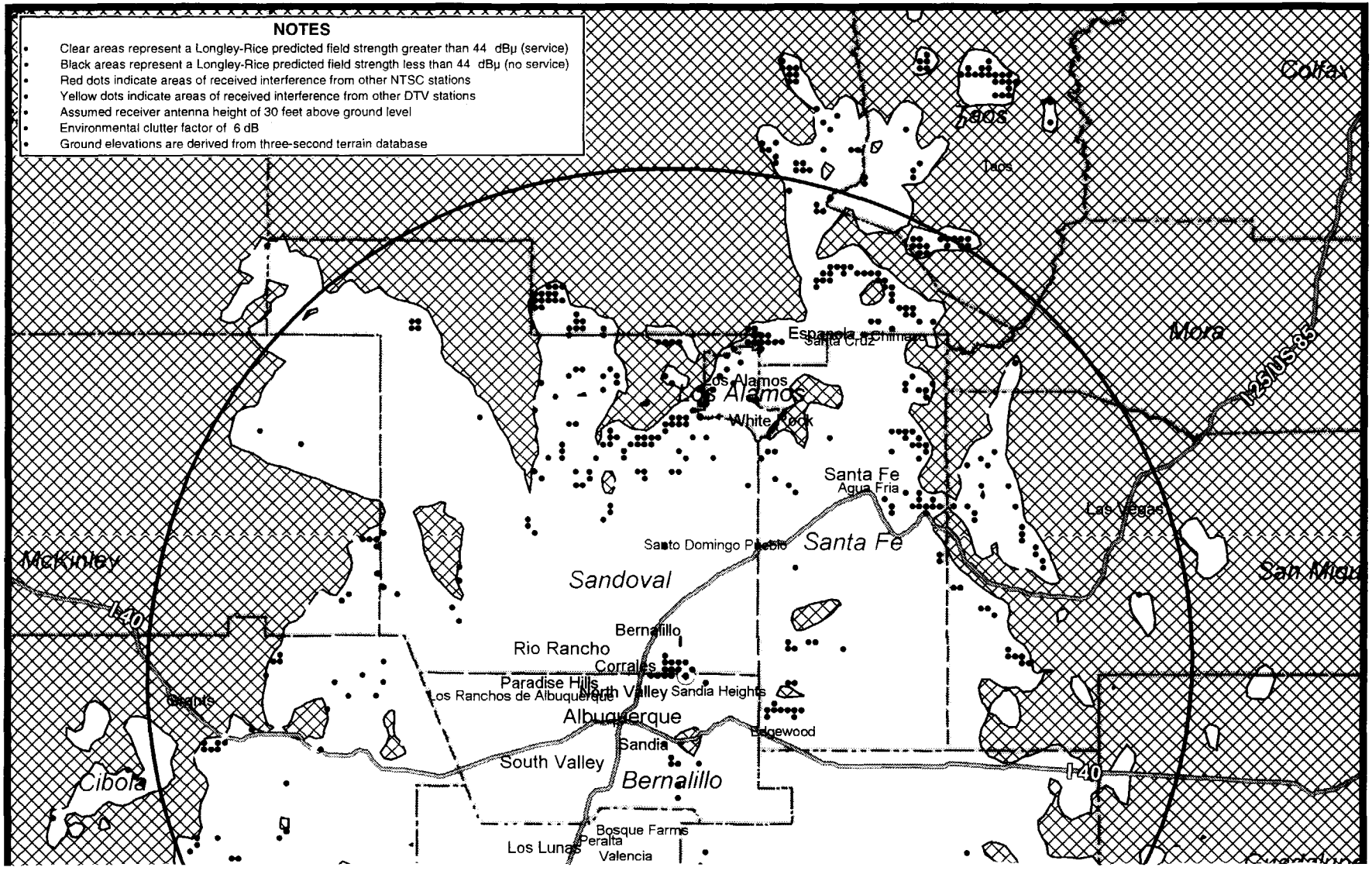


NTSC SERVICE AND RECEIVED INTERFERENCE AREAS

KSTP-TV
ST. PAUL, MINNESOTA
CH 5 100 KW 436 M

du Treil, Lundin & Rackley, Inc., Sarasota, Florida

Figure 4


NOTES
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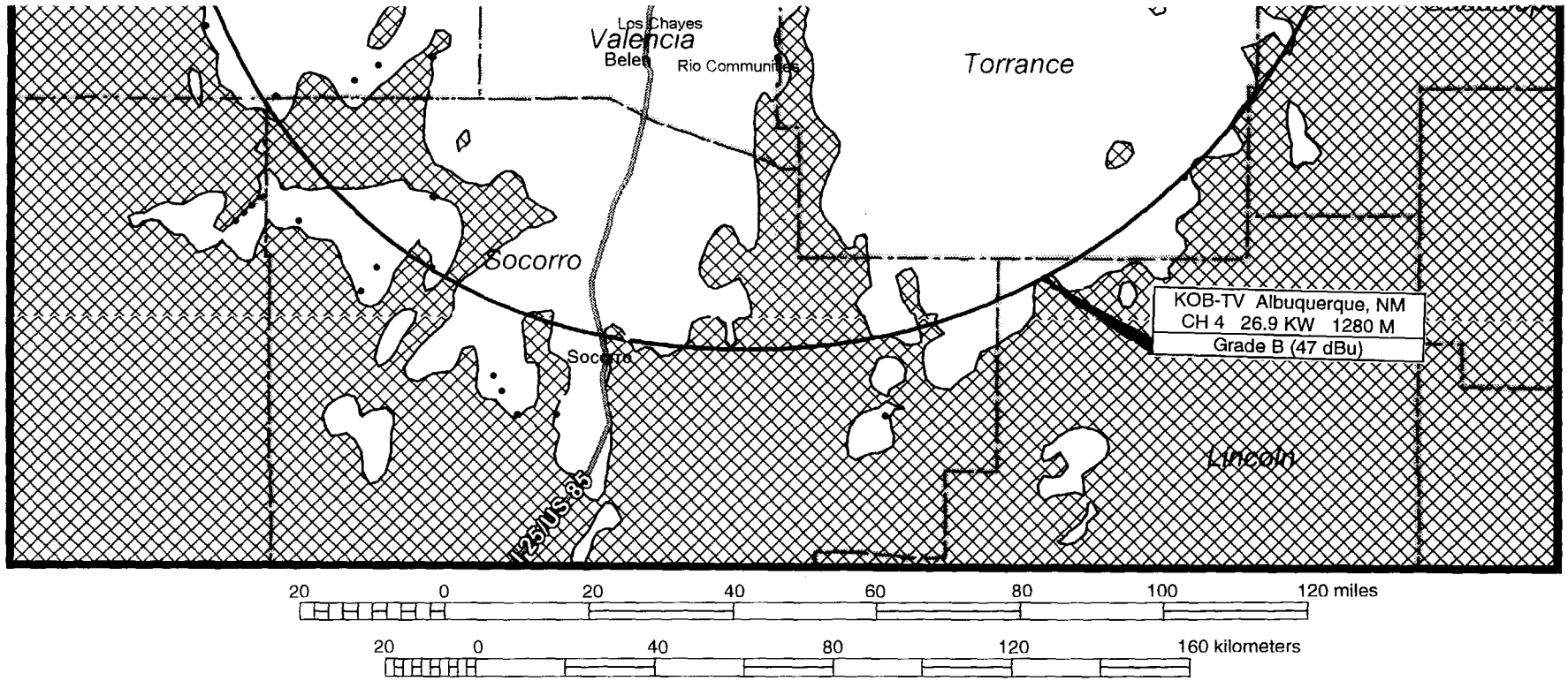
Black areas represent a Longley-Rice predicted field strength less than 44 dBμ (no service)
Red dots indicate areas of received interference from other NTSC stations
Yellow dots indicate areas of received interference from other DTV stations
Assumed receiver antenna height of 30 feet above ground level
Environmental clutter factor of 6 dB
Ground elevations are derived from three-second terrain database
Colfax
Taos
Mora
Espanola
Santa Cruz
Los Alamos
White Rock
Santa Fe
Agua Fria
Las Vegas
Santo Domingo Pueblo
McKinley
Sandoval
Bernalillo
Rio Rancho
Corrales
Paradise Hills
Los Ranchos de Albuquerque
North Valley
Sandia Heights
Albuquerque
Edgewood
Sandia
South Valley
Cibola
Bosque Farms
Peralta
Los Lunas
Valencia
I-40
US-84/US-85

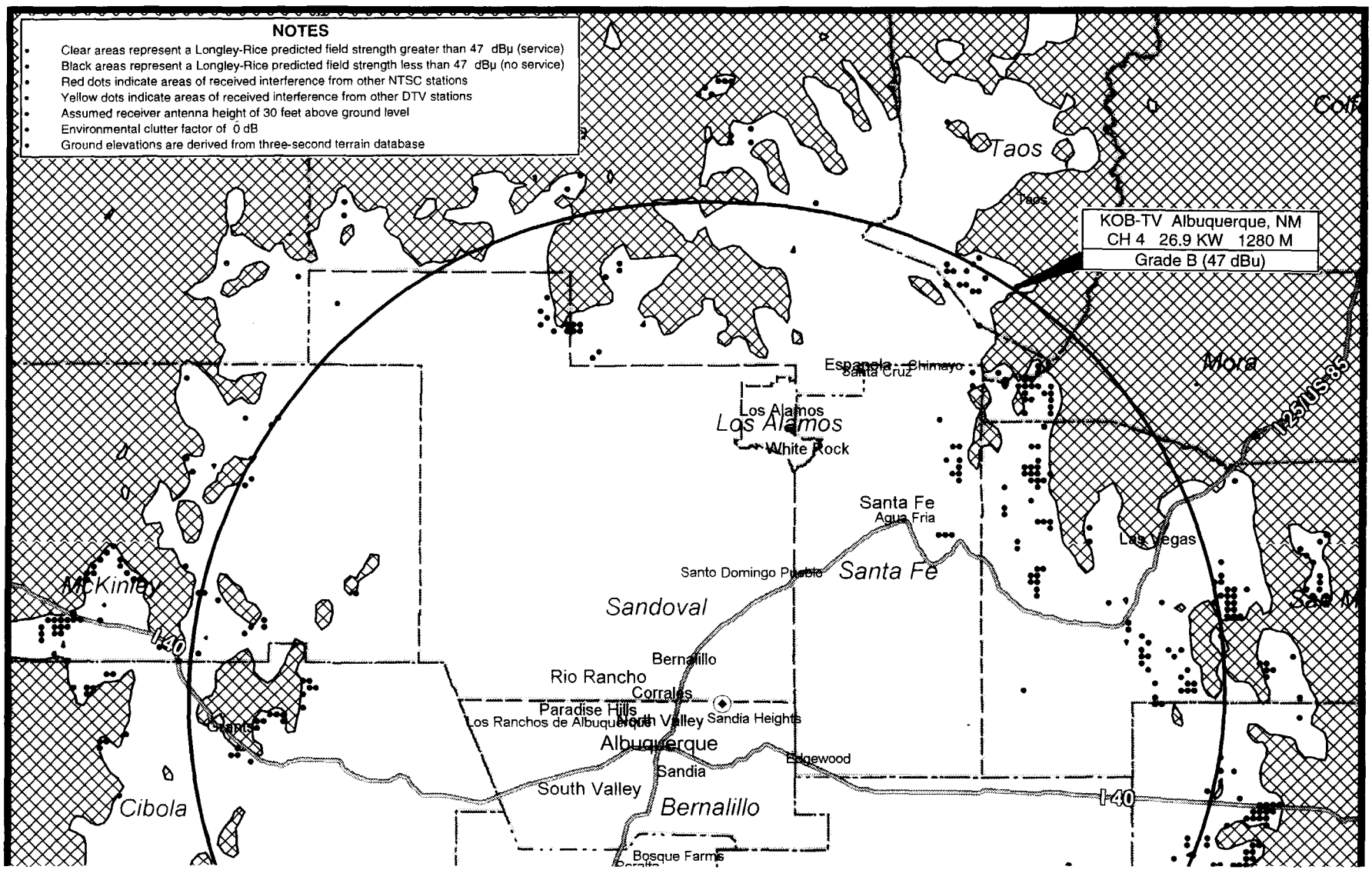


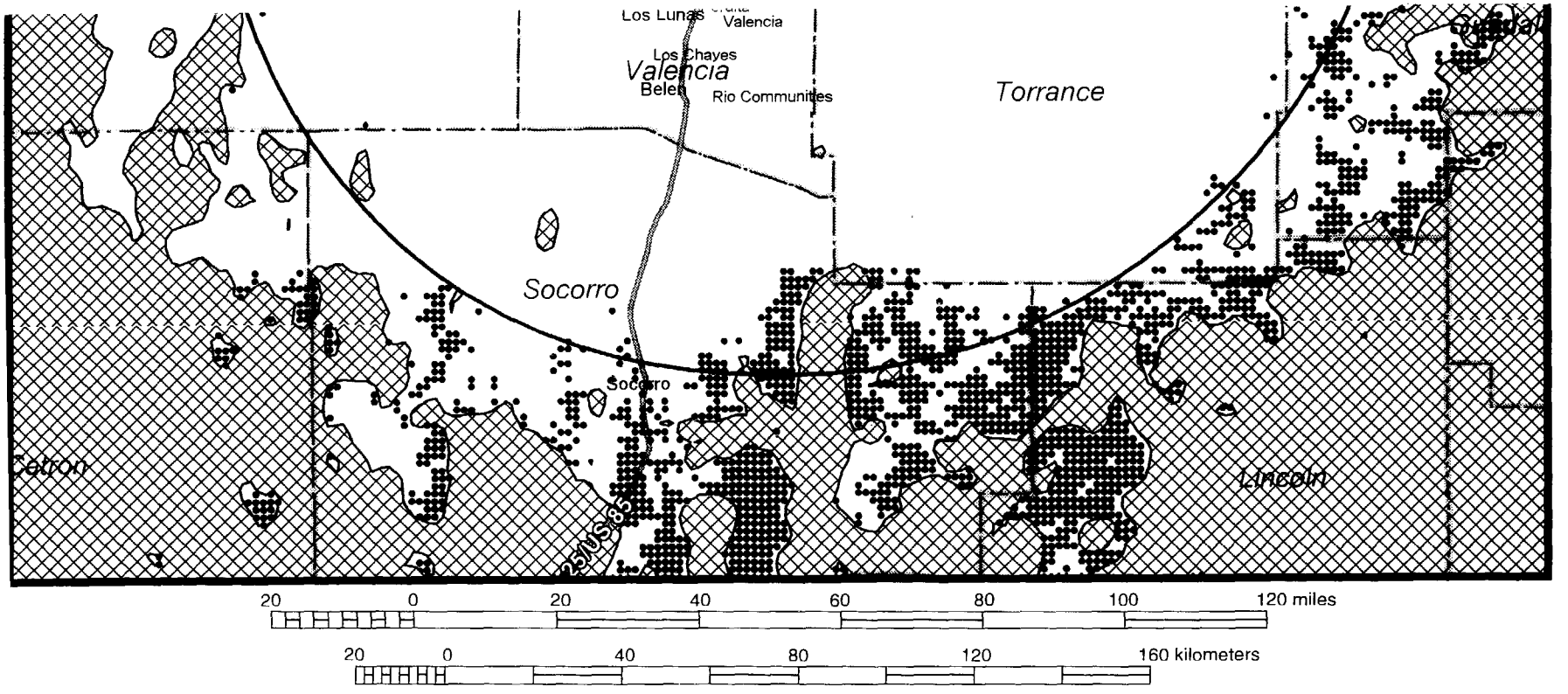
DTV SERVICE AND RECEIVED INTERFERENCE AREAS

KOB-TV
ALBUQUERQUE, NEW MEXICO
CH 48 718 KW 1280 M

du Treil, Lundin & Rackley, Inc., Sarasota, Florida

Figure 3


NOTES
Clear areas represent a Longley-Rice predicted field strength greater than 47 dBμ (service)
Black areas represent a Longley-Rice predicted field strength less than 47 dBμ (no service)
Red dots indicate areas of received interference from other NTSC stations
Yellow dots indicate areas of received interference from other DTV stations
Assumed receiver antenna height of 30 feet above ground level
Environmental clutter factor of 0 dB
Ground elevations are derived from three-second terrain database
KOB-TV Albuquerque, NM
CH 4 26.9 KW 1280 M
Grade B (47 dBu)
Taos
Mora
Los Alamos
White Rock
Santa Fe
Agua Fria
Las Vegas
Santo Domingo Pueblo
Sandoval
McKinley
Cibola
Bernalillo
Rio Rancho
Corrales
Paradise Hills
Los Ranchos de Albuquerque
Albuquerque
Sandia Heights
Edgewood
Sandia
South Valley
Bosque Farms
I-40
US-84



NTSC SERVICE AND RECEIVED INTERFERENCE AREAS

KOB-TV
ALBUQUERQUE, NEW MEXICO
CH 4 26.8 KW 1280 M

du Treil, Lundin & Rackley, Inc., Sarasota, Florida

Figure 2

TECHNICAL EXHIBIT
REPLY COMMENTS OF HUBBARD BROADCASTING

Tabulation of Low Power Translator Stations which
Duplicate Hubbard Programming

Callsign	Community	State
K08HQ	Chinle CDP	AZ
K09WN	Ganado	AZ
K68BL	Klegetoh	AZ
K44BP	Many Farms	AZ
K69AF	Many Farms	AZ
K65BI	Window Rock	AZ
K11BA	Allison	CO
K65CI	Bayfield	CO
K11HU	Blanco River	CO
K11LP	Cortez	CO
K53DR	Cortez City	CO
K07KB	Del Norte	CO
K66BN	Durango	CO
K09CA	Dyke	CO
K08GM	Pagosa	CO
K54DH	Pagosa	CO
K63AN	Romeo	CO
K10AD	Vallecito	CO
W07AI	Pittsfield	MA
K66BI	Aitkin	MN
K28DD	Bemidji	MN
K50AK	Bemidji	MN
K64AM	Big Falls	MN
W58AI	Birchdale	MN
K16BQ	Brainerd	MN
K57BJ	Brainerd	MN
KLKS-LP	Breezy Point	MN
K63BW	Donnelly/Her	MN
K34DS	Ely	MN
K60FY	Frost	MN
K55BR	Grand	MN
W61AF	Grand Marias	MN
K65BA	Granite	MN
K49BU	International	MN
K61GE	Jackson	MN
K65AE	Kabetogoma	MN
K69DA	Little Falls	MN
K30AC	Marshall	MN
K60BL	Max	MN
K55BY	Northome	MN
K02HG	Northome	MN

Callsign	Community	State
K49AJ	Olivia	MN
K24CV	Park Rapids	MN
K60AO	Redwood	MN
K32AF	St. James	MN
K57CN	Wabasha	MN
K20AC	Wadena	MN
K14AD	Willmar	MN
K58AF	Windom	MN
K29CT	Worthington	MN
K09LY	Abiquiu	NM
K69AC	Alamogordo	NM
K081M	Amalia	NM
K110N	Animas	NM
K06MS	Black Lake	NM
K57EB	Bloomfield	NM
K09KJ	Brazos	NM
K10LE	Buena Vista	NM
K53BN	Capitan/Ruid	NM
K57FI	Carlsbad	NM
K51CN	Carrizozo	NM
K56EH	Cebolla	NM
K09IG	Cliff-Gila	NM
K55AM	Clovis	NM
K57AB	Colfax	NM
K09IA	Conchas Dam	NM
K63EQ	Crownpoint	NM
K68EG	Datil/Horse Springs	NM
K68DX	Deming	NM
K30EK	Dulce/Lumber	NM
K48AX	Eagle Nest	NM
K61AF	Forrest/McAl	NM
K61BS	Gallina	NM
K06IS	Gallup City	NM
K65BH	Gallup City	NM
K06CU	Grants	NM
K42DJ	Las Cruces	NM
K06ED	Las Vegas	NM
K59CM	Lordsburg	NM
K06EV	Mescalero	NM
K55CV	Montoya/Newk	NM
K09DZ	Mora	NM
K25FI	Mora	NM
K04DV	Navajo	NM
K06FT	Penasco	NM
K09JK	Quemado	NM
K09GR	Questa	NM
K26DX	Raton	NM
K06FZ	Red River	NM

Callsign	Community	State
K09LN	Rinconoda	NM
K06EM	Roy Village	NM
K09VG	San Mateo	NM
K36DI	Santa Rosa	NM
K09KC	Santa Rosa	NM
K09NA	Sheep	NM
K06EH	Silver City	NM
K10MG	Socorro	NM
K06LE	Taos Town	NM
K55BP	Thoreau	NM
K51BQ	Truth or	NM
K67AI	Tucumcari	NM
K06FV	Vermejo Park	NM
K09CR	Wagon Mound	NM
K16DL	Zuni Pueblo	NM
W07AV	Gloversville	NY
W51AE	Bennington	VT
W63AR	Ladysmith	WI
W57AS	Spooner	WI